

IN THE CLAIMS

Amend the claims as follows:

1. (Currently amended) A semiconductor package for enhancing heat dissipation, comprising:
 - a die having an active surface;
 - a leadframe, including:
 - a die pad having a first surface and a second surface, said die being attached to said first surface of the die pad; and
 - a plurality of leads electrically connected to the active surface of said die and separated from said die pad, said leads having a first surface and a second surface opposite the first surface;
 - an encapsulant sealing said die and at least a portion of the first surface of the leads in said leadframe but not sealing the second surface of the leads; and
 - a heat sink attached to the second surface of said die pad and at least a portion of the second surface of leads in said plurality of leads with a thermally conductive and electrically insulating adhesive glue, said heat sink being constructed as a body whose entire ~~having an~~ outer surface is exposed in entirety ~~is exposed in entirety~~ to ambient atmosphere and no portion of said heat sink ~~which is encapsulated is in contact with~~ said encapsulant.
2. (Previously presented) The semiconductor package of Claim 1, wherein said heat sink is made of material selected from the group consisting of copper, copper alloy, aluminum or aluminum alloy.
3. (Previously presented) The semiconductor package of Claim 1, wherein said adhesive glue is selected from the group consisting of epoxy, B-stage epoxy or silicone.

4. (Previously presented) The semiconductor package of Claim 1, wherein said leadframe is of a cavity-up or cavity-down type of leadframe.

5. (Previously presented) The semiconductor package of Claim 4, wherein said heat sink further comprises a heat radiator on its top and said leadframe is a cavity-down type of leadframe.

6. (Previously presented) A semiconductor package of claim 1, manufactured by the steps of:

(a) attaching said die to the first surface of said die pad and electrically connecting the active surface of said die to the plurality of leads;

(b) adding encapsulant to an upper mold for sealing said die and one portion of the first surface of said plurality of leads;

(c) attaching said heat sink to the second surface of said die pad and at least one portion of the second surface of leads in said plurality of leads with the thermally conductive and electrically insulating adhesive glue and with the thermally conductive and electrically insulating adhesive glue and

(d) forming and singulating said leadframe.

7. (Previously presented) The semiconductor package of Claim 6, wherein in step (d), said leadframe is a cavity-up or cavity-down type of leadframe.

8. (Currently amended) A semiconductor package for enhancing heat dissipation, comprising:

a die having an active surface;

a leadframe, including:

a central-hole die pad having a first surface and a second surface, said first

surface being attached to said die; and

a plurality of leads electrically connected to the active surface of said die and separated from said die pad, said leads having a first surface and a second surface opposite the first surface;

an encapsulant sealing one portion of the first surface of said plurality of leads and said die in said leadframe but not sealing the second surface of the leads; and

a heat sink having a T-type structure including a portion extending in a hole of said die pad and attached to said second surface of said die by a thermally conductive and electrically insulating adhesive glue, said heat sink also being attached to the second surface of said die pad and at least a portion of the second surface of leads in said plurality of leads with said thermally conductive and electrically insulating adhesive glue, said heat sink being constructed as a body whose entire ~~having an~~ outer surface is exposed in entirety ~~is exposed in entirety~~ to ambient atmosphere and no portion of said heat sink ~~which is encapsulated is in contact with~~ said encapsulant.

9. (Previously presented) The semiconductor package of Claim 8, wherein said heat sink is made of a material selected from the group consisting of copper, copper alloy, aluminum or aluminum alloy.

10. (Currently amended) The semiconductor package of Claim 8, wherein said adhesive glue is made of material selected from the group consisting of epoxy, B-stage epoxy or silicone.

11. (Previously presented) The semiconductor package of Claim 8, wherein said leadframe is of a cavity-up or cavity-down type of leadframe.

12. (Previously presented) The semiconductor package of Claim 11, wherein the

top of said heat sink further comprises a heat radiator and said leadframe is a cavity-down type of leadframe.

13. (Previously presented) The semiconductor package of claim 8, manufactured by the steps of:

(a) attaching said die to the first surface of said die pad and electrically connecting the active surface of said die to the plurality of leads;

(b) adding encapsulant to an upper mold for sealing said die and one portion of the first surface of said plurality of leads;

(c) attaching said heat sink to the second surface of said die pad and at least one portion of the second surface of leads in said plurality of leads with said thermally conductive and electrically insulating adhesive glue; and

(d) forming and singulating said leadframe.

14. (Previously presented) The semiconductor package of Claim 13, wherein in step (d), said leadframe is of a cavity-up or cavity-down type leadframe.

15. (Currently amended) A semiconductor package for enhancing heat dissipation, comprising:

a die having an active surface;

a plurality of leads electrically connected to the active surface of said die, said leads having a first surface and a second surface opposite the first surface;

an encapsulant sealing said die and at least a portion of the first surface of said leads but not sealing the second surface of the leads; and

a heat sink attached to at least a portion of the second surface of leads in said plurality of leads with a thermally conductive and electrically insulating adhesive glue, said heat sink

being constructed as a body whose entire ~~having an~~ outer surface is exposed in entirety to ambient atmosphere and no portion of said heat sink ~~which is encapsulated~~ is in contact with said encapsulant.

16. (Previously presented) The semiconductor package of Claim 15, wherein said heat sink is made of a material selected from the group consisting of copper, copper alloy, aluminum or aluminum alloy.

17. (Previously presented) The semiconductor package of Claim 15, wherein said adhesive glue is made of selected from the group consisting of epoxy, B-stage epoxy or silicon.

18. (Previously presented) The semiconductor package of Claim 15, wherein said leads are a part of a leadframe of a cavity-up or cavity-down type.

19. (Previously presented) The semiconductor package of Claim 18, wherein the top of said heat sink further comprises a heat radiator and said plurality of leads is a part of a cavity-down type of leadframe.

20. (Previously presented) A method of manufacturing a semiconductor package comprising the steps of:

(a) electrically connecting the active surface of a die to the plurality of leads;

(b) adding encapsulant to an upper mold for sealing said die and one portion of the first surface of said plurality of leads; and

(c) attaching said heat sink to one portion of the second surface of at least some leads in said plurality of leads with a thermally conductive and electrically insulating adhesive glue, said heat sink being so attached that its entire outer surface is exposed to ambient atmosphere and no portion thereof is encapsulated in said encapsulant.

REMARKS:

Careful consideration has been given to the Official Action of May 29, 2003 and reconsideration of the application as amended is respectfully requested.

The Examiner has rejected claims 1, 3, 4, 6, 7, 10, 11, 13-15, 17, 18, and 20 under 35 U.S.C. § 102 as being anticipated by Kinsman et al. (Kinsman). Claims 2, 8, 9, and 16 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Kinsman and further in view of Yamaguchi.

The rejection of the independent claims 1, 8 and 15 on Kinsman is not well taken. The Examiner states in the rejection that the heat sink of Kinsman is exposed to the environment. In responding to our arguments the Examiner notes that "the claims merely recite said heat sink being exposed to ambient atmosphere and not encapsulated in said encapsulant". The Examiner further goes on to state that "claim 1 makes no indication that the entire structure of the heat sink is exposed to the environment". The Examiner concludes that "the reference in which only a small portion of the heat sink is exposed reads on the claim".

It is respectfully submitted that the Examiner has not acted on claim 1 as previously amended wherein it is recited "said heat sink having an outer surface exposed in entirety to ambient atmosphere and no portion of which is encapsulated in said encapsulant". Therefore, the last action should be withdrawn in favor of a new action in which the claims should all be allowed as they include the distinctive feature which the Examiner says is omitted. Alternatively, if the Examiner issues a new rejection, this should not be made final.

Nevertheless, in order to expedite the allowance of the application, further amendments have been made in the claims and additional arguments are advanced hereafter.

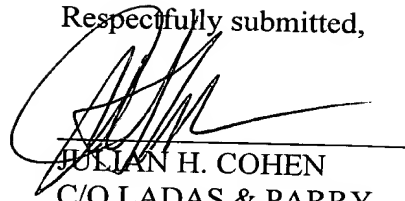
The claims now additionally recite that the entire outer surface of the heat sink body is exposed to ambient atmosphere and no portion of the heat sink is in contact with the encapsulant. This language clearly distinguishes over Kinsman. Furthermore, the plurality of leads which are electrically connected to the active surface of the die are separated from the die pad.

Kinsman discloses placing the heat sink inside the lower molding body (see Fig. 1A) before it is encapsulated. In contrast, the heat sink of the present invention is outside the encapsulant and is mounted on the die pad and leads with a thermally conductive and electrically insulating adhesive glue. The heat sink of Kinsman is partly immersed in the lower molding body of the encapsulant and will have a mismatch of thermal expansions between the heat sink and the encapsulant. The encapsulant of the present invention does not seal the second surface of the leads and it only employs an upper molding body for the semiconductor package. By comparison, the package body of Kinsman comprises both an upper and lower molding body.

The Examiner states that the cited Terashima patent is deleted from the rejection because the Kinsman patent discloses a die pad (in the central portion of the lead structure shown) which is part of the lead structure. However, claims 1 and 8 both recite a leadframe including leads and a die pad on which a die is attached and wherein the die pad is separate from and not part of the lead frame. Furthermore, Kinsman discloses the IC package with a Leads-Under-chip(LUS) structure in which a die is attached to the extension portions of leads.

On the basis of the above action and remarks, it is respectfully submitted that the application is in allowable condition and favorable reconsideration is earnestly solicited.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Julian H. Cohen', is written over a horizontal line.

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